INSTRUCTION MANUAL

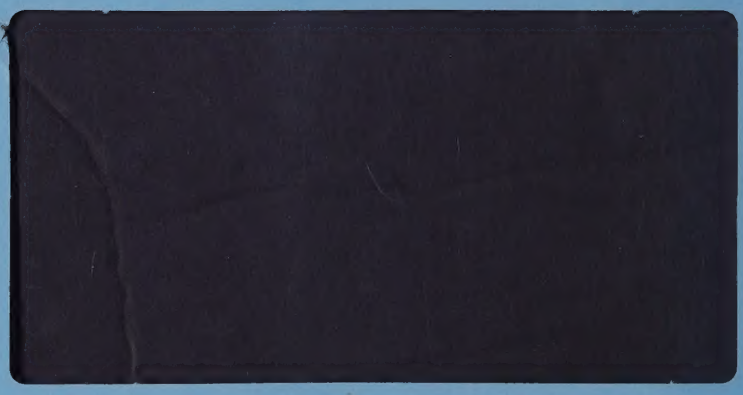
REGULATED POWER SUPPLIES

MODEL #LJS-10-5-OV-6453

MP MASTER
MA28698

LAMBDA

LAMBDA ELECTRONICS MELVILLE, L. I., N. Y.



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Addenda

STD Instruction Manual: LJS-10-Series

MODEL #LJS-10-5-OV-6453

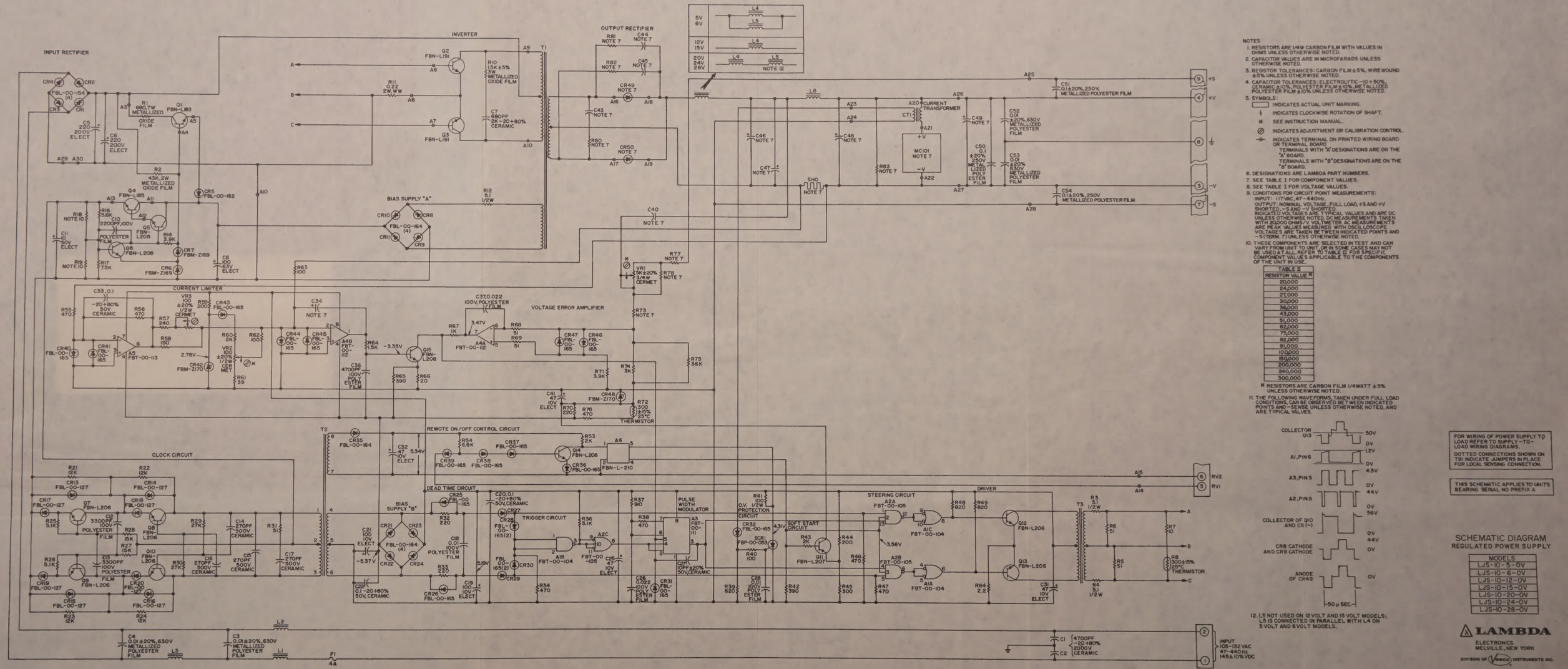
ADDENDA

MODEL #LJS-10-Series-6453

The paragraphs of this instruction manual apply in general to the above model.

This modified unit differs from a standard unit in the following way:

The unit is treated to render it fungi inert.



NOTES

1. RESISTORS ARE 1/4W CARBON FILM WITH VALUES IN OHMS UNLESS OTHERWISE NOTED.
2. CAPACITOR VALUES ARE IN MICROFARADS UNLESS OTHERWISE NOTED.
3. RESISTOR TOLERANCES: CARBON FILM ±5%, WIREWOUND ±5% UNLESS OTHERWISE NOTED.
4. CAPACITOR TOLERANCES: ELECTROLYTIC -10+50%, CERAMIC ±10%, POLYESTER FILM ±10%, METALLIZED POLYESTER FILM ±10% UNLESS OTHERWISE NOTED.
5. SYMBOLS:
   - ▭ INDICATES ACTUAL UNIT MARKING.
   - ↻ INDICATES CLOCKWISE ROTATION OF SHAFT.
   - ✱ SEE INSTRUCTION MANUAL.
   - ⊘ INDICATES ADJUSTMENT OR CALIBRATION CONTROL.
   - ⊸ INDICATES TERMINAL ON PRINTED WIRING BOARD OR TERMINAL BOARD. TERMINALS WITH "A" DESIGNATIONS ARE ON THE "A" BOARD. TERMINALS WITH "B" DESIGNATIONS ARE ON THE "B" BOARD.
6. DESIGNATIONS ARE LAMBDA PART NUMBERS.
7. SEE TABLE I FOR COMPONENT VALUES.
8. SEE TABLE I FOR VOLTAGE VALUES.
9. CONDITIONS FOR CIRCUIT POINT MEASUREMENTS: INPUT: 117 VAC, 47-440 Hz. OUTPUT: NOMINAL VOLTAGE, FULL LOAD, +S AND +V SHORTED, -S AND -V SHORTED. INDICATED VOLTAGES ARE TYPICAL VALUES AND ARE DC UNLESS OTHERWISE NOTED. DC MEASUREMENTS TAKEN WITH 20,000 OHMS/V VOLTMETER. AC MEASUREMENTS ARE PEAK VALUES MEASURED WITH OSCILLOSCOPE. VOLTAGES ARE TAKEN BETWEEN INDICATED POINTS AND -S (TERM. 7) UNLESS OTHERWISE NOTED.
10. THESE COMPONENTS ARE SELECTED IN TEST AND CAN VARY FROM UNIT TO UNIT, OR IN SOME CASES MAY NOT BE USED AT ALL. REFER TO TABLE II FOR SPECIFIC COMPONENT VALUES APPLICABLE TO THE COMPONENTS OF THE UNIT IN USE.

TABLE II

RESISTOR VALUE M
20,000
24,000
27,000
30,000
36,000
43,000
51,000
62,000
75,000
82,000
91,000
100,000
150,000
200,000
240,000
300,000

M RESISTORS ARE CARBON FILM 1/4 WATT ±5% UNLESS OTHERWISE NOTED.

11. THE FOLLOWING WAVEFORMS, TAKEN UNDER FULL LOAD CONDITIONS, CAN BE OBSERVED BETWEEN INDICATED POINTS AND -SENSE UNLESS OTHERWISE NOTED, AND ARE TYPICAL VALUES.

12. L5 NOT USED ON 12 VOLT AND 15 VOLT MODELS; L5 IS CONNECTED IN PARALLEL WITH L4 ON 5 VOLT AND 6 VOLT MODELS.

FOR WIRING OF POWER SUPPLY TO LOAD REFER TO SUPPLY-TO-LOAD WIRING DIAGRAMS.

DOTTED CONNECTIONS SHOWN ON T3I INDICATE JUMPERS IN PLACE FOR LOCAL SENSING CONNECTION.

THIS SCHEMATIC APPLIES TO UNITS BEARING SERIAL NO PREFIX A

SCHEMATIC DIAGRAM
REGULATED POWER SUPPLY

MODELS
LJS-10-5-0V
LJS-10-6-0V
LJS-10-12-0V
LJS-10-15-0V
LJS-10-20-0V
LJS-10-24-0V
LJS-10-28-0V

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MELVILLE, NEW YORK
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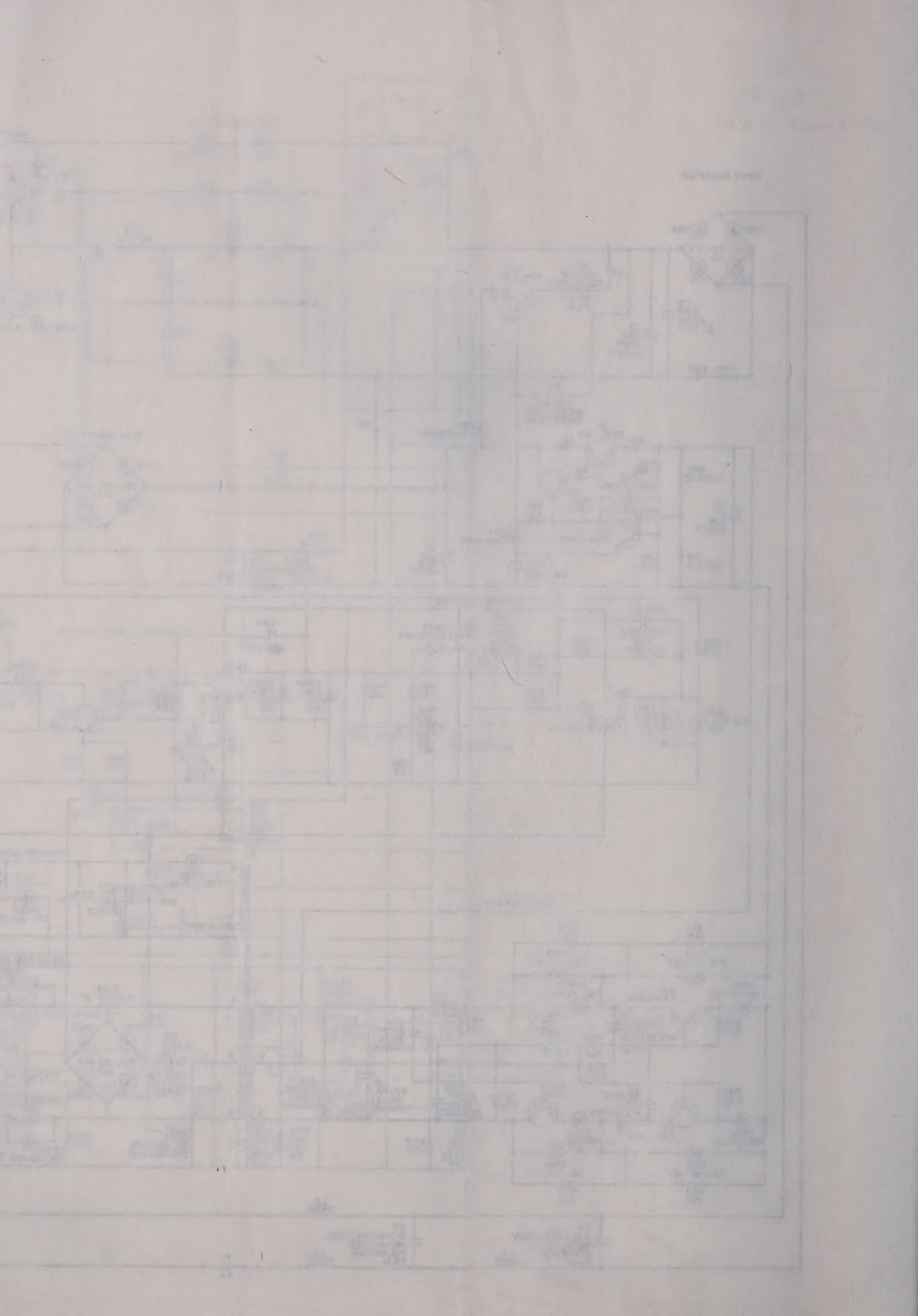

INSTRUCTION MANUAL

REGULATED POWER SUPPLIES

LJS-10 SERIES

LAMBDA

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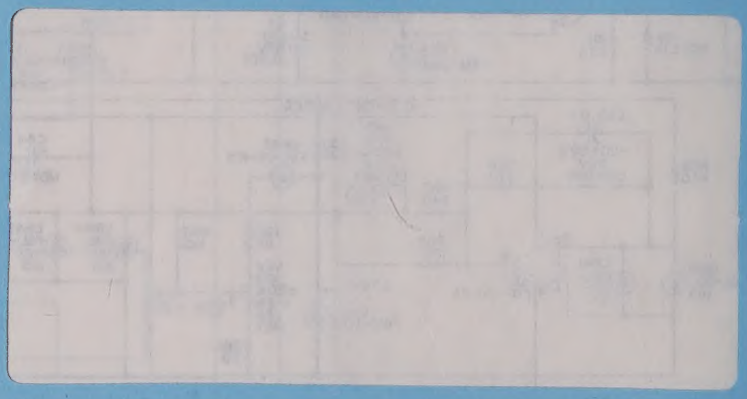

INSTRUCTION MANUAL

FOR

REGULATED POWER SUPPLIES

LJS-10 SERIES

This manual provides instructions intended for the operation of Lambda power supplies, and is not to be reproduced without the written consent of Lambda Electronics Corp. All information contained herein applies to all LJS-10 models unless otherwise specified.

LAMBDA ELECTRONICS MELVILLE, L.I., N.Y.

MAIN PLANT TELEPHONE: 516 MYrtle 4-4200

IM-LJS-10

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SPECIFICATIONS AND FEATURES

DC OUTPUT — Voltage regulated for line and load. See table I for voltage and current ratings.

TABLE I
VOLTAGE AND CURRENT RANGES

MODELS	VOLTAGE RANGE	MAXIMUM CURRENT (AMPS) AT AMBIENT TEMPERATURE		
		50°C	60°C	71°C
LJS-10-5-OV	5 ± 5%	10.0	8.0	5.5
LJS-10-6-OV	6 ± 5%	8.3	6.6	4.5
LJS-10-12-OV	12 ± 5%	4.2	3.4	2.3
LJS-10-15-OV	15 ± 5%	3.3	2.6	1.8
LJS-10-20-OV	20 ± 5%	2.5	2.0	1.4
LJS-10-24-OV	24 ± 5%	2.1	1.7	1.2
LJS-10-28-OV	28 ± 5%	1.8	1.4	1.0

Current range must be chosen to suit the appropriate maximum ambient temperature. Current ratings apply for entire voltage range.

REGULATED VOLTAGE OUTPUT

Regulation ..... 0.4% line or load with input variations from 105-132 or 132-105 volts AC and load variations from no load to full load.

Ripple and Noise ..... 10mV RMS, 50mV peak-to-peak for LJS-10-5-OV,-6-OV models; 15mV RMS, 100mV peak-to-peak for LJS-10-12-OV, -15-OV, -20-OV, -24-OV, and -28-OV with either positive or negative terminal grounded.

Temperature Coefficient ..... Change in output voltage 0.03%/°C max.

Remote Programming

External Resistor ..... Nominal 1000 ohms/volt output.

Programming Voltage ..... One-to-one voltage change.

Remote Sensing ..... Provision is made for remote sensing to eliminate effect of power output lead resistance on DC regulation.

REMOTE ON-OFF CONTROL — The DC output of all LJS-10 power supplies can be turned on and off remotely by means of digital command or switch closure.

Logic Level	0 to +5 volts (logic "0" for ON, logic "1" for OFF)
Switch Closure	"Close" for ON, "Open" for OFF.
Loading	1.6 ma sinking required. (TTL compatible)

STORAGE TIME — 16 ms min. at full rated current, maximum rated output voltage, and 105 VAC input.

OVERSHOOT — No overshoot under conditions of power turn-on, turn-off, or power failure.

INPUT

AC Input	105-132 VAC at 47-440 Hz. Input power: 68 Watts* For operation at frequencies above 440 Hz, consult factory.

*With output loaded to full current rating.

DC Input	145 VDC ± 10%. Input power: 68 Watts†.

†With output loaded to full current rating.

INPUT FUSE — Fuse F1 protects the input wiring to the power supply. Overload of power supply does not cause fuse failure.

OVERLOAD PROTECTION

Electrical

External	Automatic electronic current limiting circuit, limits output current to a preset safe value. Automatic current limiting protects the load and power supply when external overloads and direct shorts occur.
Internal	Fuse F1 provides protection against internal circuit failure.

OVERVOLTAGE PROTECTION — All LJS-10 models include fixed built-in overvoltage protection circuits which prevent damage to the load caused by excessive power supply output voltage. See table below for overvoltage protector firing ranges.

MODEL	OVERVOLTAGE PROTECTOR TRIP-POINT RANGE (VOLTS)
LJS-10-5-OV	6.3 — 6.9
LJS-10-6-OV	7.1 — 7.5
LJS-10-12-OV	13.3 — 14.1
LJS-10-15-OV	16.5 — 17.5
LJS-10-20-OV	22.1 — 23.5
LJS-10-24-OV	26.5 — 28.1
LJS-10-28-OV	30.9 — 32.9

INPUT AND OUTPUT CONNECTIONS — Terminal blocks on front of chassis. Reed-Prince No. 2 screwdriver is required for terminal screws.

OPERATING AMBIENT TEMPERATURE RANGE AND DUTY CYCLE — Continuous duty from 0°C to 71°C ambient with corresponding load current ratings for all modes of operation.

STORAGE TEMPERATURE (non operating) — -55°C to +85°C

VDC ADJ. Control — Voltage adjust control permits adjustment of DC output over entire operating range.

GUARANTEE — 5 year guarantee from date of shipment . . . materials and labor.

PHYSICAL DATA

Size	1-25/32" x 4-3/4" x 7-15/16"
Weight	2.0 lbs. net
Finish	Gray, FED. STD. 595 No. 26081

MOUNTING — One surface with tapped mounting holes can be utilized for mounting this unit. All LJS-10 power supplies must be mounted with top facing up and in a horizontal plane. Refer to figure 10 for mounting details.

THEORY OF OPERATION

GENERAL

The Lambda power supply consists of an input circuit; internal power supply and starter circuit; clock circuit; dead-time circuit; trigger circuit; pulse width modulator; soft-start circuit; steering circuit, voltage error amplifier; current limiter circuit; remote ON OFF control circuit; inverter; output rectifier and over-voltage protection circuit.

The circuit arrangement is shown in block diagram form in figure 8. The circuitry is discussed with reference to the block diagram and the schematic diagram.

FUNCTIONAL DESCRIPTION

Input Circuit

Single phase AC input power is applied to the input rectifier CR1—CR4, C5, C6 via EMI suppression network L1, L2, C3, L3, and C4. Fuse F1 protects against internal power supply circuit failure.

Internal Power Supply Circuit

The starter circuit CR5, R1, C8 and Q1 applies input power to the internal power supply consisting of Q4, Q5, Q6, CR6, CR7, C10, C11, R14, R16 and R17, whenever input power is initially applied or when a no-load condition exists at the output after initial turn-on. Feedback bias supply "A" CR8—CR11 and R12 applies power to the internal power supply from the 20KHz inverter. The internal power supply, a linear power supply, provides 28.8 VDC at the emitter of Q4.

Clock Circuit

The clock circuit consisting of Q7—Q10, CR13—CR20, R21—R31, C12—C17, and T2 functions as the master oscillator and the source of DC power to the control circuitry. The waveform at the collector of Q8 and Q10 is square, with a 50% duty cycle in periods of 50 microseconds.

Control Circuitry

The pulse width modulator consisting of A3, R37, R38, CR31, C25—C27 is supplied triggered pulses by trigger circuit CR25—CR30, R32—R34, A1 and A2. Bias supply "B" CR21—CR24 and C19 provides 5VDC to A1, A2 and A3 and to driver circuit transistors Q12 and Q13. The steering circuit, which consists of A1 and A2 converts single-phase pulses from the pulse width modulator to two phase pulses which are fed to driver circuit Q12, Q13, R84, C31 and T3, which, in turn, applies the pulses to switching transistors Q2 and Q3 in the inverter. Dead-time circuit R32, R33 and C18 creates non-conducting dead-time for inverter switching transistors Q2 and Q3. Soft start circuit transistor Q11 prevents voltage over-shoot when the unit is remotely turned on via a remote turn-on signal applied to terminals RV1 and RV2.

Voltage Error Amplifier

The voltage error amplifier consists of A4, C37, R68, R69, CR46, CR47 and R71, reference voltage diode CR48 and C41, R70, R72, R76 and output voltage sensing network R73, R74, R1, R77, R78, and C40. The programming current, 1 mA used in the sensing network, is determined by R70.

Current Limiter Circuitry

The current limit circuitry consists of: buffer amplifier A5, CR40, CR41, R55, R56, C33; current sampling circuit SH0, R63; reference voltage network R59—R61, VR2, CR42, CR43 and amplifier A4, CR44, CR45, C34.

The buffer amplifier acts to change the polarity of the line-drop voltage between the load and the output side of SH0 with unity gain. R63 serves to sum the voltage drop across SH0 and the line and between the load and the input side of SH0 to A4. The reference voltage is set by adjustment of VR2 through summing resistor R62 and serves to limit overcurrent conditions in the output of the supply.

The amplifier compares the reference voltage with the current sampling voltages and is combined with the voltage error amplifier signal through the action of Q15.

Remote ON/OFF Control Circuit

The remote ON/OFF control circuit A6, CR35, C32, CR36—CR39, Q14, R53 and R54 controls unit operation by means of an external ON/OFF control signal, which is generally compatible with TTL voltage levels, supplied to terminals RV1 and RV2. Terminals RV1 and RV2 are isolated from the input line and the output of the unit by means of photo isolator A6.

When RV1 and RV2 are open circuited or are supplied high TTL voltage, a transistor contained in A6 turns off and one of three inputs to A2 goes to a low voltage level of TTL, which causes the inverter to shut down.

Inverter

The inverter, a push-pull circuit consists of two switching power transistors Q2 and Q3. When Q2 turns on, switching current flows through the primary of T1 in one direction and in the next half period of the cycle Q3 turns on and Q2 turns off and switching current then flows through the primary of T1 in the opposite direction.

Output Circuit

Positive and negative pulses supplied by the secondary of T1 are rectified by full-wave rectifiers CR49 and CR50; are filtered by a filter network and EMI suppression network: L4, L5, C46, C47, L6 and C48 and then supplied to the output.

Overvoltage Protection Circuit

The overvoltage protection circuit consists of two sections, one part, a current transformer circuit consists of the current transformer and a hybrid OV crowbar module MC-101. When the output voltage reaches the trip-point of hybrid overvoltage module MC-101, the module fires, crowbarring the output of the supply to a safe level. The second part of the circuit consisting of SCR1, CR32, R39—R41 and C28, uses the output voltage signal generated by the current transformer to turn on SCR1, which, in turn, crowbars logic circuitry of A2 that causes the inverter to shut down.

BASIC MODE OF OPERATION

This power supply operates as a constant voltage source provided the load current does not exceed the rated value at 50°C. For continuous operation, load current must not exceed the rating for each ambient temperature. When rated load current is exceeded, voltage decreases towards zero and the current at short circuit is held to a safe value.

CONNECTIONS FOR OPERATION

NOTE: Make all connections to the unit before applying input power.

Ground Connections. The Lambda power supply can be operated either with negative or positive output terminal grounded. Both positive and negative ground connections are shown in the diagrams for all suggested output connections illustrated in this manual.

Connection Terminals. Make all connections to the supply at the terminal block on the front of the supply. Use a Reed-Prince no. 2 screwdriver on terminal screws. Apply input power to input terminals; always connect the ungrounded AC or DC lead to the bottom terminal.

The supply positive terminal is brought out to terminal +V. The supply negative terminal is brought out to terminal —V. Recommended wiring of the power supply to the load and selection of wiring is shown in figures 1 through 9. Selection of proper wiring is made on the basis of load requirements. Make all performance checks and measurements of current or voltage at the front output terminals. Connect measuring devices directly to terminals or use the shortest leads possible.

The following paragraph applies to all units except those bearing serial numbers in 610000, 620000, 630000, and 680000 series.

Remote on-off control is brought out to terminal RV1 and terminal RV2. Either digital command or switch closure can be used for on-off control. Logic "0" or "close" for ON and logic "1" or "open" for OFF. When digital command is used, RV2 should be connected to incoming signal ground. Maximum command voltage is +24 volts. Proper remote on-off control connection is shown for all suggested output connections illustrated in this manual.

The following paragraph applies to units bearing serial numbers in 610000, 620000, 630000, and 680000 series only.

Remote on-off control is brought out to terminal RV1 and terminal RV2. RV2 should always be connected to ground ($\doteq$). Either digital on-off command or switch closure can be used for on-off control. Logic "0" or "close" for ON and logic "1" or "open" for OFF. If remote on-off control is not required, both terminals RV1 and RV2 should be connected to ground. The output will then always be on as long as input power is present. Proper remote on-off control connection is shown for all suggested output connections illustrated in this manual.

SUPPLY LOAD CONNECTIONS

Connections for Operation as a Constant Voltage Source

The output impedance and regulation of the power supply at the load may change when using the supply as a constant voltage source and connecting leads of practical length are used. To minimize the effect of the output leads on these characteristics, remote sensing is used. Recommended types of supply load connections with local or remote sensing are described in the following paragraphs.

Refer to figure 1 to determine voltage drop for particular cable length, wire size and current conditions. Lead lengths must be measured from supply terminals to load terminals as shown in figure 2.

Local Sensing Connection, Figure 3. Local sensing is the connection suitable for applications with relatively constant load or for application with short power output leads.

Remote Sensing Connection, Figure 4. Remote sensing provides complete compensation for the DC voltage drops in the connecting cables. Sensing leads should be a twisted pair to minimize AC pick-up. A 2.5 mf elect., capacitor may be required between output terminals and sense terminals to reduce noise pick-up.

Programmed Voltage Connections, Using External Resistor, Figure 5. Discrete voltage steps can be programmed with a resistance voltage divider valued at a nominal 1000 ohms/volt change and a shorting-type switch as shown in figure 5. When continuous voltage variations are required, use a variable resistor with the same 1000 ohms/volt ratio in place of the resistive voltage divider and shorting-type switch. Use a low temperature coefficient resistor to assure most stable operation.

Before programming, adjust programming resistor for zero resistance and set voltage adjust control to the minimum rated output voltage. Output voltage of programmed supply will nominally be minimum output voltage plus 1 volt per 1000 ohms.

As shown in figure 5, voltages can be programmed utilizing either local or remote sensing connections, as desired.

Programmed Voltage Connections Using Programming Voltage, Figure 6. The power supply voltage output can be programmed with an externally connected programming power supply. The output voltage change of the programmed supply will maintain a one-to-one ratio with the voltage of the programming supply. If the output voltage control of the programmed supply is set to minimum output voltage, output voltage of the programmed supply will be minimum output voltage plus voltage of programming supply.

The programming supply must have a reverse current capability of 1.1ma. minimum.

Alternatively, when supplies with less than 1.1ma. reverse current capability are used, a resistor capable of drawing 1.1ma. at the minimum programming voltage must be connected across the output terminals of the programming supply. This programming supply must be rated to handle all excess resistor current at the maximum programming voltage.

Connections For Series Operation, Figure 7.

The voltage capability of LJS-10 power supplies can be extended by series operation. Figure 7 shows the connections for either local or remote sensing in a series connection where the voltage control of each unit functions independently to control the output.

A diode, having a current carrying capability equal to or greater than the maximum current rating of the supply, must be used and connected as shown in figure 7. The diode blocking voltage should be at least twice the maximum rated output voltage of the supply. See table I, of SPECIFICATIONS AND FEATURES, for power supply current and voltage ratings.

OPERATION AFTER PROTECTIVE DEVICE SHUTDOWN

Fuse Shutdown. Fuse will blow when the maximum rated current value for the fuse is exceeded. Fatigue failure of fuses can occur when mechanical vibrations from the installation combine with thermally induced stresses to weaken the fuse metal. Many fuse failures are caused by a temporary condition and replacing the blown fuse will make the fuse protected circuit operative.

Overvoltage Shutdown. When the power supply output voltage increases above the overvoltage limit, the overvoltage protection circuit will short circuit output of the supply and shut down inverter operation. After eliminating the cause(s) for overvoltage, resume operation of the supply by momentarily interrupting the AC input circuit.

MAINTENANCE

GENERAL

This section describes trouble analysis routine, calibration and test procedures that are useful for servicing the Lambda power supply. A trouble chart is provided as an aid for the troubleshooter. Refer to the section on SPECIFICATIONS AND FEATURES for the minimum performance standards.

TROUBLE ANALYSIS

Whenever trouble occurs, systematically check all fuses, primary power lines, external circuit elements, and external wiring for malfunction before troubleshooting the equipment. Failures and malfunctions often can be traced to simple causes such as improper jumpers and supply-load connections or fuse failure due to metal fatigue.

Use the electrical schematic diagram and block diagram, figure 8, as an aid to locating trouble causes. The schematic diagram contains various circuit voltages that are averages for normal no load operation. Measure these voltages using the conditions for measurement specified on the schematic diagram. Use measuring probes carefully to avoid causing short circuits and damaging circuit components.

CHECKING TRANSISTORS AND CAPACITORS

Check transistors with an in-circuit transistor checker. If no checker is available, transistors can be checked with an ohmmeter that has a highly limited current capability. Observe proper polarity for PNP or NPN to avoid error in measurement. The forward transistor resistance is low but never ZERO; backward resistance is always higher than the forward resistance.

Do not assume trouble is eliminated when only one part is replaced. This is especially true when one transistor fails, causing other transistors to fail. Replacing only one transistor and turning power on before checking for additional faulty components could damage the replaced component.

When soldering semi-conductor devices, hold the lead being soldered with a pair of pliers or a commercial heat sink device placed between the component and the solder joint.

NOTE: The leakage resistance obtained from a simple resistance check of a capacitor is not always an indication of a faulty capacitor. In all cases the capacitors are shunted with resistances, some of which have low values. Only a dead short is a true indication of a shorted capacitor.

PRINTED CIRCUIT BOARD MAINTENANCE TECHNIQUES

1. If foil is intact, but not covered with solder, it is a good contact. Do not attempt to cover with solder.
2. Voltage measurements can be made from either side of the board. Use a needle-point probe to penetrate to the wiring whenever a protective coating is used on the wiring. A brass probe can be soldered to an alligator clip adapted to measuring instrument.
3. Always use a heat sink when soldering transistors; a transistor pad with mounting feet is an effective heat sink.
4. Broken or damaged printed wiring is usually the result of an imperfection, strain or careless soldering. To repair small breaks, tin a short piece of hook-up wire to bridge the break, and holding the wire in place, flow solder along the length of wire so that it becomes part of the circuitry.
5. When unsoldering components from the board never pry or force loose the part; unsolder the component by using the wicking process described below:
   a) Select a 3/16 inch tinned copper braid for use as a wick; if braid is not available, select AWG No. 14 or No. 16 stranded wire with 1/2 inch insulation removed.
   b) Dip the wick in liquid rosin flux.

c) Place the wick onto the soldered connection and apply soldering iron onto the wick.

d) When sufficient amount of solder flows onto the wick, freeing the component, simultaneously remove iron and wick.

TROUBLE CHART

The trouble chart is intended as a guide for locating trouble causes and is used along with the schematic diagram.

The operating conditions assumed for the trouble chart are as follows:

a) AC power of proper voltage and frequency is present at input terminals.

b) Either positive or negative terminal is connected to chassis ground.

c) The power supply is connected for constant voltage with local sensing. See schematic; dotted lines indicate jumpers connected for local sensing operation.

SAFETY NOTICE

DANGEROUS VOLTAGES EXIST IN THIS EQUIPMENT. OBSERVE THE USUAL SAFETY PRECAUTIONS WHEN OPERATING OR SERVICING THE EQUIPMENT TO AVOID SHOCK OR INJURY.

TROUBLE SHOOTING CHART

Symptom	Possible Cause	Remedy
1. Zero volts DC output, no-waveform between collector of Q10 and negative of C5.	Open F1. Defective Q2, Q3.	Check and replace as necessary.
2. Same as 1, waveform between collector of Q10 and negative of C5 is correct, voltage across C19 is zero or too low.	Defective CR21 thru CR24. Defective Q12, Q13.	Check and replace as necessary.
3. Same as 2, voltage across C19 is correct, no-waveform between A2-8 and -S (GND).	Defective A1, A2. Defective CR25 thru CR30.	Check and replace as necessary.
4. Same as 3, waveform between A2-8 and -S (GND) is correct, no-waveform between A3-3 and -S (GND).	Defective A3, A4, A5.	Replace as required.
5. Same as 4, waveform between A3-3 and -S (GND) is correct, voltage across A2-2 to -S (GND) is too low.	Disconnected wire at terminals RV1 and RV2.	Reconnect as required.
	Defective A6.	Check voltage across C32, if voltage across C32 is correct, replace A6 as required.
	Defective SCR1.	Check and replace as necessary.
	Defective OV module MC-101.	Replace as required.

TROUBLE SHOOTING CHART

Symptom	Possible Cause	Remedy
6. Same as 5, voltage across A2-2 to -S is correct, no-waveform between A1-6 to -S.	Defective A1, A2. Defective Q12, Q13.	Check and replace as necessary.
7. Same as 6. waveform between A1-6 to -S is correct, no-waveform between collector of Q12 and -S.	Defective Q12, Q13.	Check and replace as necessary.
8. Same as 7, waveform between collector of Q12 and -S is correct, no-waveform between anode of CR49 and -S.	Defective Q2, Q3.	Check and replace as necessary.
9. Output DC voltage is too low.	Defective CR48.	Check and replace as necessary.
10. R1 is very hot under full load.	Defective CR8 thru CR11.	Check and replace as necessary.
11. Defective current limiting.	Defective CR42. Defective A4, A5.	Check and replace as necessary.
12. DC output unregulated.	Defective A4.	Replace as required.

PERFORMANCE CHECKS

Check the ripple and regulation of the power supply using the test connection diagram shown in figure 9. Use suggested test equipment or equivalent to obtain accurate results. Refer to SPECIFICATIONS AND FEATURES for minimum performance standards.

Set the differential meter, DC DVM (John Fluke Model 891A or equivalent) to the selected power supply operating voltage. Check the power supply load regulation accuracy while switching from the no load to load condition. Long load leads should be a twisted pair to minimize AC pick-up.

Use a Variac to vary the line voltage from 105-132 or 132-105 volts AC and check the power supply line regulation accuracy on the DVM differential meter.

Use a TVM, John Fluke Model 931B or equivalent, to measure rms ripple voltage of the power supply DC output. Use oscilloscope to measure peak-to-peak ripple voltage of the power supply DC output.

ADJUSTMENT OF CALIBRATION CONTROLS VR1, VR3.

Whenever voltage and current indications do not reflect maximum ratings, adjust VR1 and VR3 as follows. The adjustment procedure requires that the power supply is removed from associated equipment, is at an ambient temperature of 25-30°C, and is stabilized and not operating.

1. Remove AC input power to the supply.
2. Break seal on wiper of VR3 from resistor housing and turn to full CCW position.
3. Operate power supply for constant voltage with local sensing connected as shown in figure 3, with no external load, and with AC input of 132 VAC, 60 Hz.
4. Turn voltage adjust control until minimum rated output voltage is obtained.
5. Apply load so that output current is 105-110% of 50°C rating for the unit.
6. Using a differential meter, DC DVM (John Fluke Model 891A or equivalent), observe output voltage while adjusting VR3 in CW direction. Adjust VR3 until output voltage drops.
7. Remove AC power input to the supply.
8. Break seal on wiper of VR1 from resistor housing.
9. Operate power supply for constant voltage with remote sensing connected as shown in figure 4, with AC input 132 VAC, 60 Hz.
10. Adjust VR1 to the same operating point as described above.
11. Repeat steps 3 through 10 until no further adjustment is required.
12. After adjustment is completed, remove AC input power to the supply and reseal wipers of VR1 and VR3.

SERVICE

When additional instructions are required or repair service is desired, contact the nearest Lambda office where trained personnel and complete facilities are ready to assist you.

Please include the power supply model and serial number together with complete details of the problem. On receipt of this information, Lambda will supply service data or advise shipping for factory repair service.

All repairs not covered by the warranty will be billed at cost and an estimate forwarded for approval before work is started.

PARTS ORDERING

Standard components and special components used in the Lambda power supply can be obtained from the factory. In case of emergency, critical spare parts are available through any Lambda office.

The following information must be included when ordering parts:

1. Model number and serial number of power supply and purchase date.
2. Lambda part number.
3. Description of part together with circuit designation.
4. If part is not electronic part, or is not listed, provide a description, function, and location, of the part.

PARTS LIST

The electrical parts located on Lambda models LJS-10-5-OV — LJS-10-28-OV are listed here. Parts common to a group of models are listed first. Unique parts of individual models within the group are listed separately, by model, immediately following the group common parts listing.

COMMON PARTS

MODELS LJS-10-5-OV — LJS-10-28-OV

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
A1	Integrated circuit	FBT-00-104
A2	Integrated circuit	FBT-00-105
A3	Integrated circuit	FBT-00-111
A4	Integrated circuit	FBT-00-112
A5	Integrated circuit	FBT-00-113
A6	Optical amplifier	FBT-00-107
C1, C2	Cap., ceramic, 4,700 pf -20+80%, 2,000 vdc	CDK-47-016
C3, C4	Cap., metallized polyester film, 0.01 mf ±20%, 630 vdc	CGL-10-020
C5, C6	Cap., elect., 220 mf -10+50%, 200 vdc	CBR-22-171
C7	Cap., ceramic, 680 pf -20+80%, 2,000 vdc	CDJ-68-012
C8	Cap., elect., 100 mf -10+50%, 63 vdc	CBR-10-139
C9	Not assigned	
C10	Cap., polyester film, 2,200 pf ±10%, 100 vdc	CGK-22-011
C11	Cap., elect., 10 mf -10+50%, 50 vdc	CBR-10-179
C12, C13	Cap., polyester film, 3,300 pf ±10%, 100 vdc	CGK-33-012
C14 thru C17	Cap., ceramic, 270 pf ±10%, 500 vdc	CDJ-27-011
C18	Cap., polyester film, 0.01 mf ±10%, 100 vdc	CGL-10-021
C19	Cap., elect., 100 mf -10+50%, 10 vdc	CBR-10-172
C20	Cap., ceramic, 0.1 mf -20+80%, 50 vdc	CDM-10-004
C21	Same as C19	
C22	Same as C20	
C23, C24	Not assigned	
C25	Cap., elect., 47 mf -10+50%, 10 vdc	CBP-47-109
C26	Cap., polyester film, 0.022 mf ±10%, 100 vdc	CGL-22-027
C27	Cap., ceramic, 10 pf ±20%, 50 vdc	CDH-10-005
C28	Same as C18	
C29, C30	Not assigned	
C31, C32	Same as C25	
C33	Same as C20	
C35	Not assigned	
C36	Cap., polyester film, 4,700 pf ±10%, 100 vdc	CGK-47-015
C37	Same as C26	
C38, C39	Not assigned	
C41	Same as C25	
C42	Not assigned	
C50, C51	Cap., metallized polyester film, 0.1 mf ±20%, 250 vdc	CGM-10-025
C52, C53	Cap., metallized polyester film, 0.01 mf ±20%, 620 vdc	CGL-10-020
C54	Same as C50	

COMMON PARTS (Cont.)

MODELS LJS-10-5-OV — LJS-10-28-OV (Cont.)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
CR1 thru CR4	Rectifier	FBL-00-154
CR5	Rectifier	FBL-00-162
CR6, CR7	Rectifier, zener diode	FBM-Z169
CR8 thru CR11	Rectifier	FBL-00-164
CR12	Not assigned	
CR13 thru CR20	Rectifier	FBL-00-127
CR21 thru CR24	Same as CR8	
CR25 thru CR32	Rectifier	FBL-00-165
CR33, CR34	Not assigned	
CR35	Same as CR8	
CR36 thru CR41	Same as CR25	
CR42	Rectifier, zener diode	FBM-Z170
CR43 thru CR47	Same as CR25	
CR48	Same as CR42	
CT1	Current transformer	BBA-JS12V-1
F1	Fuse, 4A, 3AG, 125V	FFC-04-000
L1, L2	Choke	BBA-JS12V-1
L3	Choke	BBA-JS10A-2
L6	Choke	BBA-JS12V-3
Q1	Transistor, NPN	FBN-L183
Q2, Q3	Transistor, NPN	FBN-L191
Q4	Transistor, NPN	FBN-L185
Q5, Q6	Transistor, NPN	FBN-L208
Q7 thru Q10	Transistor, NPN	FBN-L206
Q11	Transistor, PNP	FBN-L207
Q12, Q13	Same as Q7	
Q14, Q15	Same as Q5	
R1	Res., metal oxide, 680 ohms ±10%, 8 w	DCR-68-109
R2	Res., metal oxide, 43,000 ohms ±5%, 2 w	DCT-43-092
R3, R4	Res., carbon film, 5.1 ohms ±5%, ½ w	DBN-51-001
R5, R6	Res., carbon film, 51 ohms ±5%, ¼ w	DBP-51-003

COMMON PARTS (Cont.)

MODELS LJS-10-5-OV — LJS-10-28-OV (Cont.)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
R7	Res., carbon film, 10 ohms ±5%, ¼ w	DBP-10-002
R8	Thermistor, 300 ohms ±15%, 25°C	DKR-30-005
R9	Not assigned	
R10	Res., metallized oxide film, 1,500 ohms ±5%, 3 w	DCS-15-128
R11	Res., ww, 0.22 ohm ±5%, 2 w	DEM-22-007
R12	Same as R5	
R13	Not assigned	
R14	Res., carbon film, 3,900 ohms ±5%, ¼ w	DBP-39-001
R15	Not assigned	
R16	Res., carbon film, 5,600 ohms ±5%, ¼ w	DBS-56-002
R17	Res., carbon film, 7,500 ohms ±5%, ¼ w	DBS-75-003
R20	Not assigned	
R21	Res., carbon film, 12,000 ohms ±5%, ¼ w	DBT-12-001
R24		
R25, R26	Res., carbon film, 5,100 ohms ±5%, ¼ w	DBS-51-004
R27, R28	Res., carbon film, 15,000 ohms ±5%, ¼ w	DBT-15-002
R29, R30	Res., carbon film, 27,000 ohms ±5%, ¼ w	DBT-27-003
R31	Same as R5	
R32, R33	Res., carbon film, 220 ohms ±5%, ¼ w	DBR-22-002
R34	Res., carbon film, 470 ohms ±5%, ¼ w	DBR-47-003
R35	Not assigned	
R36	Same as R25	
R37	Res., carbon film, 910 ohms ±5%, ¼ w	DBR-91-004
R38	Same as R34	
R39	Res., carbon film, 620 ohms ±5%, ¼ w	DBR-62-005
R40	Res., carbon film, 100 ohms ±5%, ¼ w	DBR-10-006
R41	Res., carbon film, 100 ohms ±5%, ½ w	DBR-10-001
R42	Res., carbon film, 390 ohms ±5%, ¼ w	DBR-39-007
R43	Res., carbon film, 2,000 ohms ±5%, ¼ w	DBS-20-005
R44	Res., carbon film, 200 ohms ±5%, ¼ w	DBR-20-008
R45	Res., carbon film, 300 ohms ±5%, ¼ w	DBR-30-009
R46, R47	Res., carbon film, 470 ohms ±5%, ¼ w	DBR-47-003
R48, R49	Res., carbon film, 820 ohms ±5%, ¼ w	DBR-82-010
R50	Not assigned	
R51		
R52	Same as R43	
R53	Res., carbon film, 6,800 ohms ±5%, ¼ w	DBS-68-017
R54	Same as R34	
R55		
R56	Res., carbon film, 240 ohms ±5%, ¼ w	DBR-24-011

COMMON PARTS (Cont.)

MODELS LJS-10-5-OV — LJS-10-28-OV (Cont.)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
R58	Res., carbon film, 150 ohms ±5%, ¼ w	DBR-20-008
R59	Same as R44	
R60	Same as R43	
R61	Res., carbon film, 39 ohms ±5%, ¼ w	DBP-39-008
R62, R63	Same as R40	
R64	Res., carbon film, 1,500 ohms ±5%, ¼ w	DBS-15-007
R65	Same as R42	
R66	Res., carbon film, 20 ohms ±5%, ¼ w	DBP-20-006
R67	Res., carbon film, 1,000 ohms ±5%, ¼ w	DBS-10-008
R68, R69	Same as R5	
R70	Same as R32	
R71	Same as R14	
R72	Same as R8	
R74	Res., carbon film, 3,000 ohms ±5%, ¼ w	DBS-30-015
R75	Res., carbon film, 36,000 ohms ±5%, ¼ w	DBT-36-018
R76	Same as R34	
R79	Not assigned	
R84	Res., carbon film, 202 ohms ±5%, ¼ w	DBN-22-004
SCR1	Rectifier, silicon controlled	FBP-00-053
T2	Transformer	ABA-JS12V-1
T3	Transformer	ABA-JS10A-3
VR1	Res., var., cermet, 5,000 ohms ±20%, ¾ w	DRS-50-028
VR2, VR3	Res., var., cermet, 100 ohms ±20%, ½ w	DRR-10-015

UNIQUE PARTS

MODEL LJS-10-5-OV

C34	Cap., elect., 10 mf -10+50%, 16 vdc	CBP-10-111
C40	Cap., metallized polyester film, 0.22 mf ±20%, 100 vdc	CAM-22-028
C43, C44, C45	Cap., polyester film, 4,700 pf ±10%, 100 vdc	CGK-47-015
C46	Cap., elect., 1,000 mf -10+50%, 10 vdc	CBS-10-178
C47, C48	Cap., elect., 2,200 mf -10+50%, 10 vdc	CBS-22-138
C49	Cap., elect., 100 mf -10+50%, 10 vdc	CBR-10-172
CR49, CR50	Rectifier	FBL-00-172
L4, L5	Choke	BBA-JS10V-2
MC101	Protector, overvoltage	L-12-OV-5
R73	Res., carbon film, 10 ohms ±5%, ¼ w	DBP-10-002
R77	Res., carbon film, 4,300 ohms ±5%, ¼ w	DBS-43-010
R78	Res., carbon film, 2,200 ohms ±5%, ¼ w	DBS-22-006
R80, R81, R82	Res., carbon film, 51 ohms ±5%, ½ w	DBP-51-001

UNIQUE PARTS (Cont.)

MODEL LJS-10-5-OV (Cont.)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
R83	Res., metal oxide, 51 ohms ±5%, 2 w	DFP-51-072
SH0	Shunt	ESP-30-018
T1	Transformer	ABA-LJS10A-5

MODEL LJS-10-6-OV

C34	Cap., elect., 10 mf -10+20%, 16 vdc	CBP-10-111
C40	Cap., metallized polyester film, 0.22 mf ±20%, 100 vdc	CAM-22-028
C43, C44, C45	Cap., polyester film, 4,700 pf ±10%, 100 vdc	CGK-47-015
C46	Cap., elect., 1,000 mf -10+50%, 10 vdc	CBS-10-178
C47, C48	Cap., elect., 2,200 mf -10+50%, 10 vdc	CBS-22-138
C49	Cap., elect., 100 mf -10+50%, 10 vdc	CBR-10-172
CR49, CR50	Rectifier	FBL-00-172
L4, L5	Choke	BBA-JS10V-2
MC101	Protector, overvoltage	L-12-OV-6
R73	Res., carbon film, 10 ohms ±5%, ¼ w	DBP-10-002
R77	Res., carbon film, 5,100 ohms ±5%, ¼ w	DBS-51-004
R78	Res., carbon film, 3,000 ohms ±5%, ¼ w	DBS-30-015
R80, R81, R82	Res., carbon film, 51 ohms ±5%, ½ w	DBP-51-001
R83	Res., metal oxide, 51 ohms ±5%, 2 w	DFP-51-072
SH0	Shunt	ESP-30-018
T1	Transformer	ABA-LJS-10A-6

MODEL LJS-10-12-OV

C34	Cap., tant., 2.2 mf ±20%, 20 vdc	CBN-22-055
C40	Cap., metallized polyester film, 0.1 mf ±20%, 100 vdc	CGM-10-034
C43, C44, C45	Cap., ceramic, 4,700 pf ±10%, 500 vdc	CDK-47-018
C46	Cap., elect., 300 mf -10+50%, 25 vdc	CBR-33-173
C47, C48	Cap., elect., 470 mf -10+50%, 25 vdc	CBR-47-140
C49	Cap., elect., 33 mf -10+50%, 25 vdc	CBP-33-106
CR49, CR50	Rectifier	FBL-00-131
L4	Choke	BBA-JS10V-2
MC101	Protector, overvoltage	L-12-OV-12
R73	Res., carbon film, 10 ohms ±5%, ¼ w	DBP-10-002
R77	Res., carbon film, 11,000 ohms ±5%, ¼ w	DBT-11-014
R78	Res., carbon film, 4,300 ohms ±5%, ¼ w	DBS-43-010
R80, R81, R82	Res., ww, 51 ohms ±5%, 1.1 w	DFP-51-073
R83	Res., metal oxide, 300 ohms ±5%, 2 w	DFR-30-126
T1	Transformer	ABA-LJS10A-12

UNIQUE PARTS (Cont.)

MODEL LJS-10-15-OV

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
C34	Cap., tant., 2.2 mf ±20%, 20 vdc	CBN-22-055
C40	Cap., metallized polyester film, 0.15 mf ±20%, 100 vdc	CAM-15-031
C43, C44, C45	Cap., ceramic, 4,700 pf ±10%, 500 vdc	CDK-47-018
C46	Cap., elect., 330 mf -10+50%, 25 vdc	CBR-33-173
C47, C48	Cap., elect., 470 mf -10+50%, 25 vdc	CBR-47-141
C49	Cap., elect., 33 mf -10+50%, 25 vdc	CBP-33-106
CR49, CR50	Rectifier	FBL-00-131
L4	Choke	BBA-JS10V-2
MC101	Protector, overvoltage	L-12-OV-15
R73	Res., carbon film, 10 ohms ±5%, ¼ w	DBP-10-002
R77	Res., carbon film, 13,000 ohms ±5%, ¼ w	DBT-13-015
R78	Res., carbon film, 10,000 ohms ±5%, ¼ w	DBT-10-013
R80, R81, R82	Res., ww, 51 ohms ±5%, 1.1 w	DFP-51-073
R83	Res., metal oxide, 360 ohms ±5%, 2 w	DFR-36-127
T1	Transformer	ABA-LJS-10A-15

MODEL LJS-10-20-OV

C34	Cap., tant., 2.2 mf ±20%, 20 vdc	CBN-22-055
C40	Cap., metallized polyester film, 0.1 mf ±10%, 100 vdc	CGM-10-034
C43, C44, C45	Cap., ceramic, 4,700 pf ±10%, 500 vdc	CDK-47-018
C46	Cap., elect., 220 mf -10+50%, 35 vdc	CBR-22-174
C47, C48	Cap., elect., 470 mf -10+50%, 35 vdc	CBR-47-141
C49	Cap., elect., 22 mf -10+50%, 35 vdc	CBP-22-107
CR49, CR50	Rectifier	FBL-00-132
L4, L5	Choke	BBA-JS10V-2
MC101	Protector, overvoltage	L-12-OV-20
R73	Res., carbon film, 390 ohms ±5%, ¼ w	DBR-39-007
R77	Res., carbon film, 18,000 ohms ±5%, ¼ w	DBT-18-016
R78	Res., carbon film, 15,000 ohms ±5%, ¼ w	DBT-15-002
R80, R81, R82	Res., ww, 51 ohms ±5%, 1.1 w	DFP-51-073
R83	Res., metal oxide, 620 ohms ±5%, 2 w	DFR-62-128
T1	Transformer	ABA-LJS10A-20

UNIQUE PARTS (Cont.)

MODEL LJS-10-24-OV

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
C34	Cap., tant., 2.2 mf ±20%, 20 vdc	CBN-22-055
C40	Cap., metallized polyester film, 0.1 mf ±10%, 100 vdc	CGM-10-034
C43, C44, C45	Cap., ceramic, 4,700 pf ±10%, 500 vdc	CDK-47-018
C46	Cap., elect., 220 mf -10+50%, 35 vdc	CBR-22-174
C47, C48	Cap., elect., 470 mf -10+50%, 35 vdc	CBR-47-141
C49	Cap., elect., 22 mf -10+50%, 35 vdc	CBP-22-107
CR49, CR50	Rectifier	FBL-00-132
L4, L5	Choke	BBA-JS10V-2
MC101	Protector, overvoltage	L-12-OV-24
R73	Res., carbon film, 10 ohms ±5%, ¼ w	DBP-10-002
R77	Res., carbon film, 22,000 ohms ±5%, ¼ w	DBT-22-017
R78	Res., carbon film, 51,000 ohms ±5%, ¼ w	DBT-51-010
R80	Res., metal oxide, 51 ohms ±5%, 2 w	DFP-51-072
R81, R82	Res., ww, 51 ohms ±5%, 1.1 w	DFP-51-073
R83	Res., metal oxide, 910 ohms ±5%, 2 w	DFR-91-129
T1	Transformer	ABA-LJS10A-24

UNIQUE PARTS (Cont.)

MODEL LJS-10-28-OV

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
C34	Cap., tant., 2.2 mf ±20%, 20 vdc	CBN-22-055
C40	Cap., metallized polyester film, 0.068 mf ±10%, 100 vdc	CGL-68-029
C43, C44, C45	Cap., ceramic, 4,700 pf ±10%, 500 vdc	CDK-47-018
C46	Cap., elect., 100 mf -10+50%, 50 vdc	CBR-10-179
C47, C48	Cap., elect., 330 mf -10+50%, 50 vdc	CBR-33-142
C49	Cap., elect., 10 mf -10+50%, 50 vdc	CBR-10-179
CR49, CR50	Rectifier	FBL-00-132
L4, L5	Choke	BBA-JS10V-2
MC101	Protector, overvoltage	L-12-OV-28
R73	Res., carbon film, 10 ohms ±5%, ¼ w	DBP-10-002
R77	Res., carbon film, 24,000 ohms ±5%, ¼ w	DBT-24-006
R78	Not assigned	
R80	Res., metal oxide, 51 ohms ±5%, 2 w	DFP-51-072
R81, R82	Res., ww, 51 ohms ±5%, 1.1 w	DFP-51-073
R83	Res., metal oxide, 1,200 ohms ±5%, 2 w	DFS-12-097
T1	Transformer	ABA-LJS-10A-28

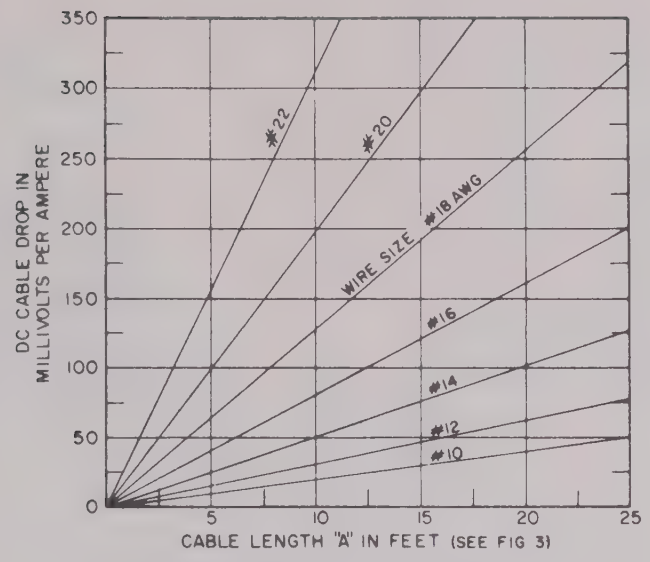


Figure 1. Cable Connection Chart.

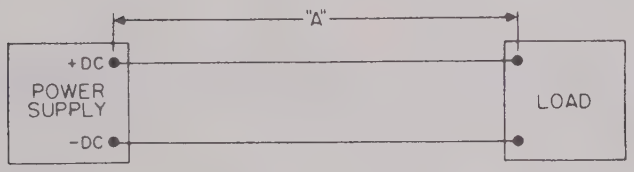


Figure 2. Cable Length "A" in Feet.

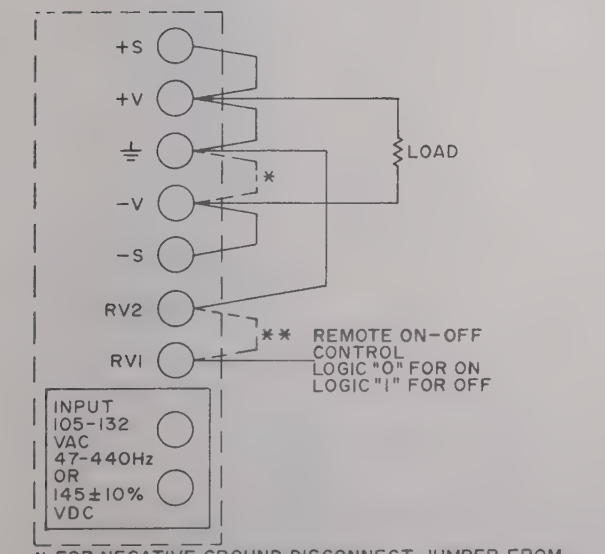

+S
+V
⏚
-V
-S
RV2
RVI
LOAD
*
** REMOTE ON-OFF CONTROL LOGIC "0" FOR ON LOGIC "1" FOR OFF
INPUT 105-132 VAC 47-440Hz OR 145±10% VDC
* FOR NEGATIVE GROUND DISCONNECT JUMPER FROM TERMINALS +V AND ⏚ AND RECONNECT TO -V AND ⏚
** IF REMOTE ON-OFF CONTROL IS NOT REQUIRED, CONNECT JUMPER BETWEEN TERMINALS RVI AND RV2.

Figure 3. Local Sensing Connections.

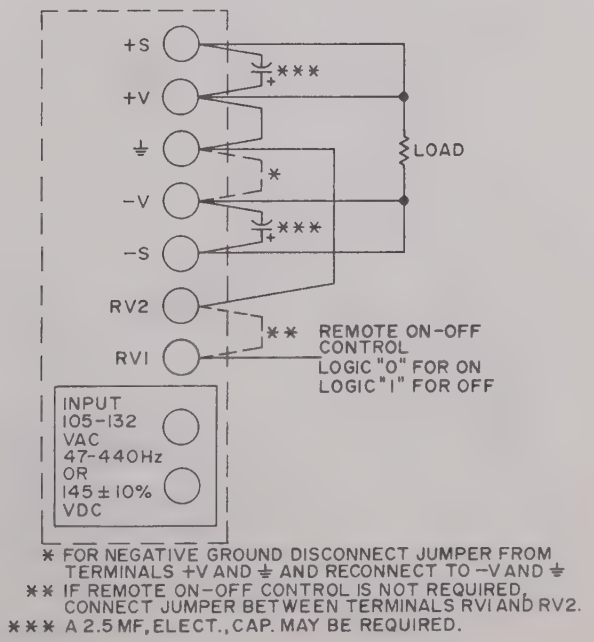

+S
+V
⏚
-V
-S
RV2
RVI
LOAD
***
*
** REMOTE ON-OFF CONTROL LOGIC "0" FOR ON LOGIC "1" FOR OFF
INPUT 105-132 VAC 47-440Hz OR 145±10% VDC
* FOR NEGATIVE GROUND DISCONNECT JUMPER FROM TERMINALS +V AND ⏚ AND RECONNECT TO -V AND ⏚
** IF REMOTE ON-OFF CONTROL IS NOT REQUIRED, CONNECT JUMPER BETWEEN TERMINALS RVI AND RV2.
*** A 2.5 MF, ELECT., CAP. MAY BE REQUIRED.

Figure 4. Remote Sensing Connections.

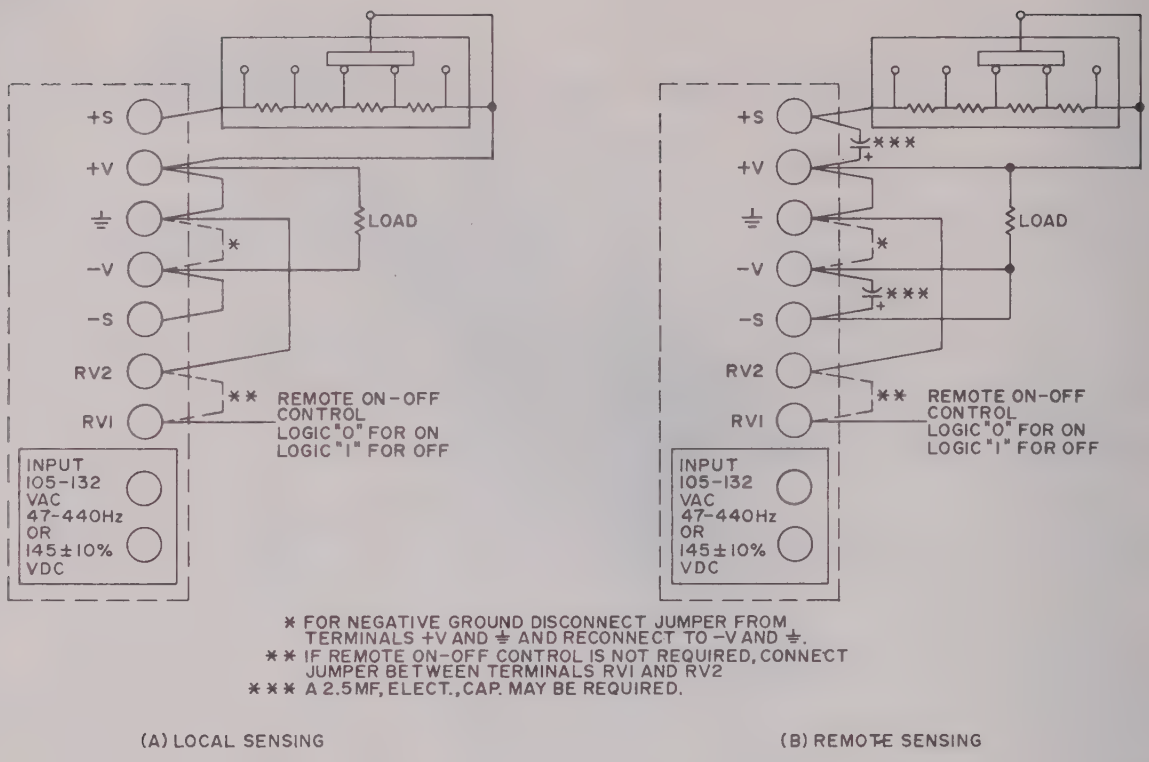


Figure 5. Programmed Voltage, With External Resistor.

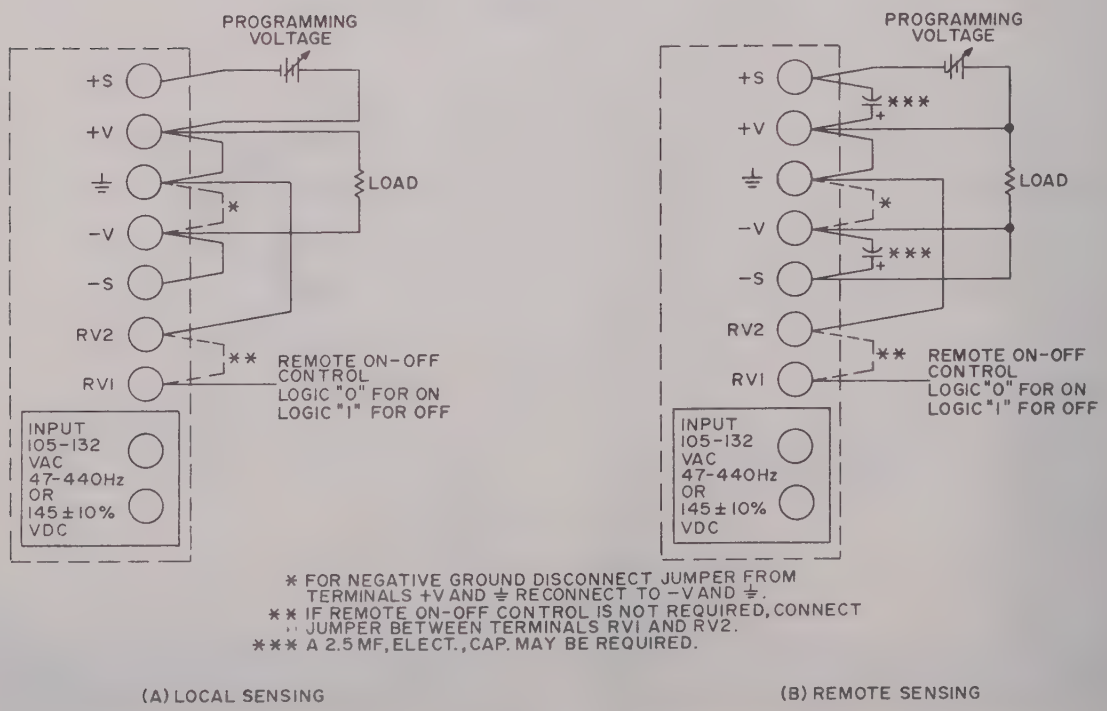
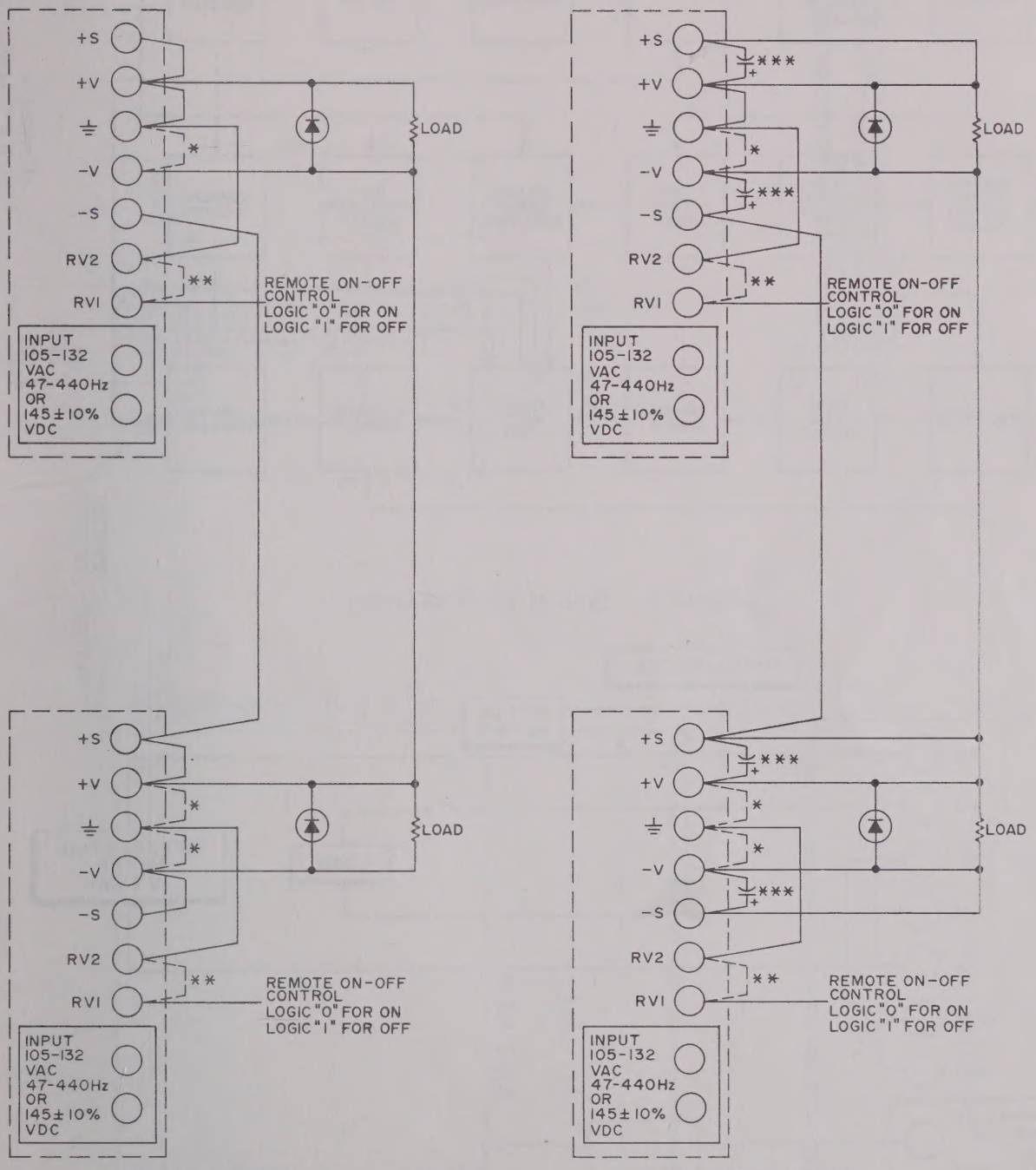


Figure 6. Programmed Voltage, with External Programming Voltage Source.



* MAKE ONLY ONE GROUND CONNECTION FOR SERIES COMBINATION. TO CHANGE GROUND AS SHOWN, REMOVE JUMPER FROM TERMINALS +V AND ⏚ ON TOP UNIT AND CONNECT ANY ONE OF THE OTHER JUMPERS AS SHOWN IN DOTTED LINE.

** IF REMOTE ON-OFF CONTROL IS NOT REQUIRED, CONNECT JUMPER BETWEEN TERMINALS RVI AND RV2.

*** A 2.5MF, ELECT., CAP. MAY BE REQUIRED.

Figure 7. Series Connections.

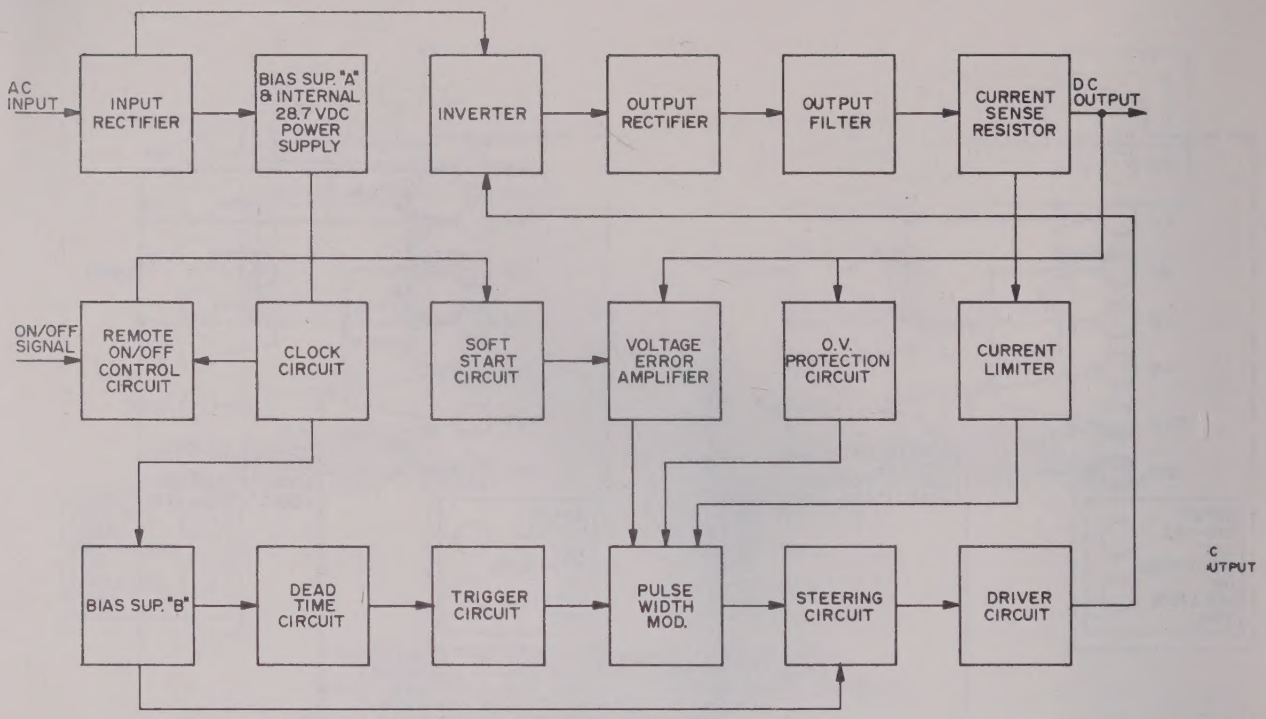


Figure 8. Typical Block Diagram.

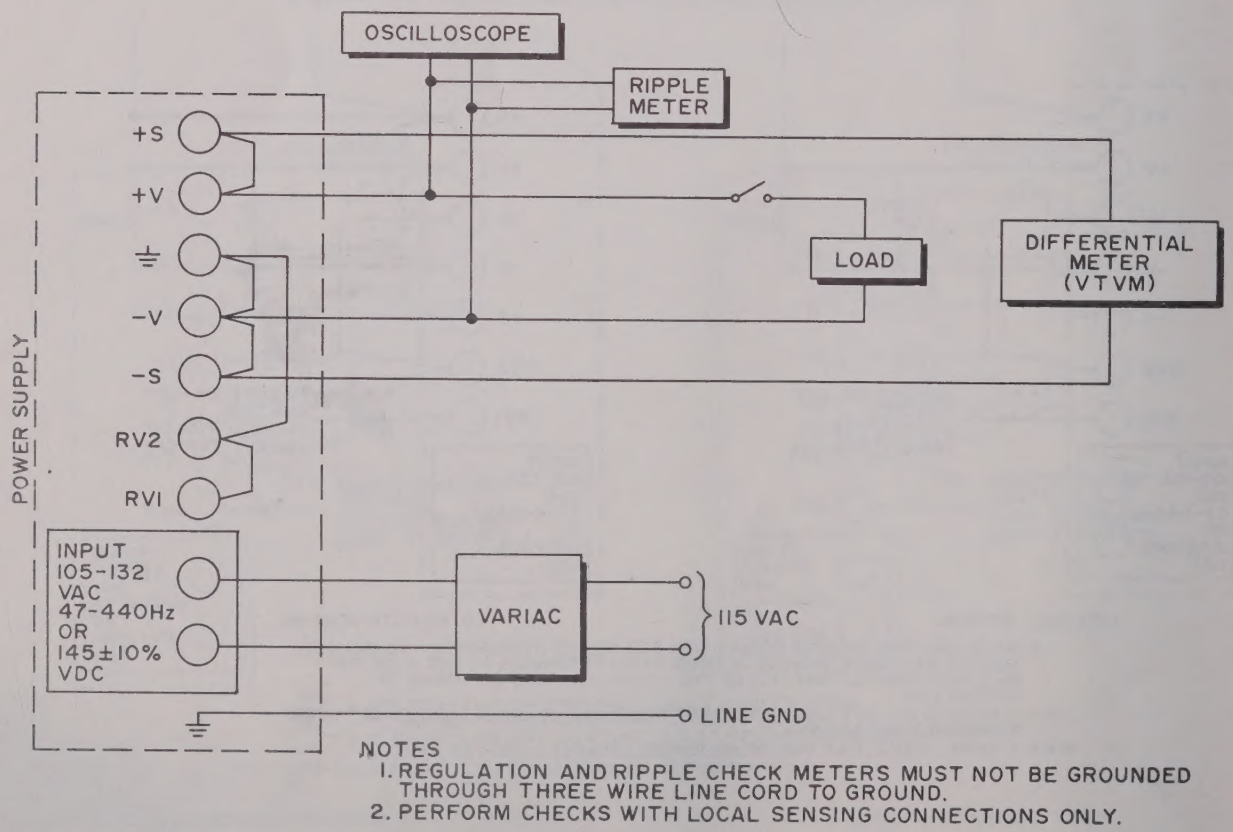


Figure 9. Test Connections for Performance Checks.

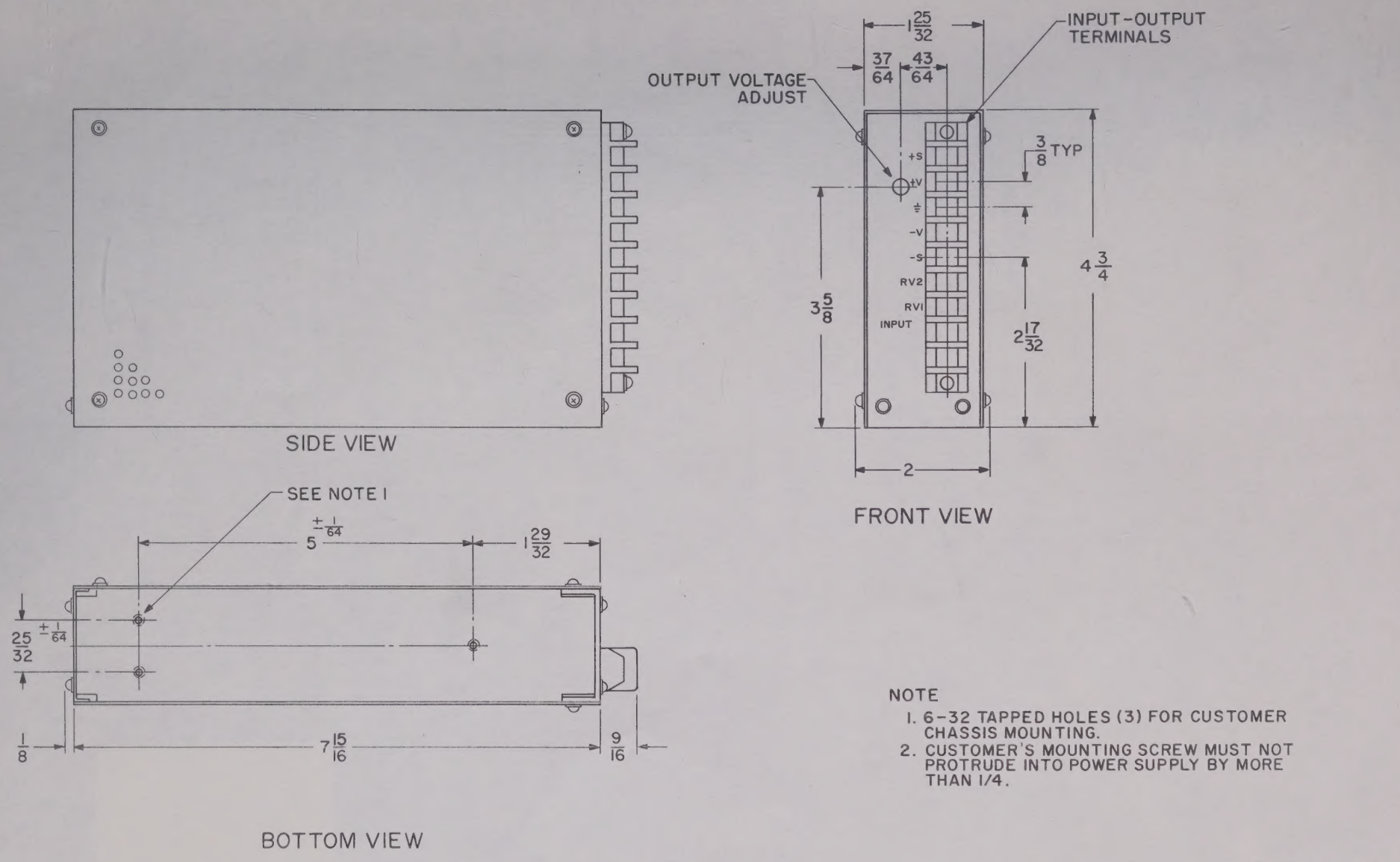


Figure 10. Outline Drawing.

TABLE I
SCHEMATIC DATA REFERENCES
MODELS LJS-10-5-OV THROUGH LJS-10-28-OV

Model	SCHEMATIC COMPONENTS														
	C34	C40	C43 C44 C45	C46	C47 C48	C49	CR49 CR50	R73	R77	R78	R80	R81, R82	R83	SH0	MC101
	±20% ELECT.	POLY FILM ±10%	±10% CERAMIC	-10+50% ELECT	-10+50% ELECT	-10+50% ELECT	FBL-00*	CARBON FILM ±5%, ¼W	CARBON FILM ±5%, ¼W	CARBON FILM ±5%, ¼W	±5%	±5%	METAL OXIDE ±5%, 2W	SHUNT ESP-30- 018	O.V. PROT. *L-12-OV-
LJS-10-5-OV	10 mf -10+50% 16 vdc	0.22 mf 100 vdc	4700 pf 100 vdc POLY- FILM	1000 mf 10 vdc	2200 mf 10 vdc	100 mf 10 vdc	172	10	4.3K	2.2K	CARBON FILM 51 ½W	CARBON FILM 51 ½W	51	ONE USED	5
LJS-10-6-OV	10 mf -10+50% 16 vdc	0.22 mf 100 vdc	4700 pf 100 vdc POLY- FILM	1000 mf 10 vdc	2200 mf 10 vdc	100 mf 10 vdc	172	10	5.1K	3K	CARBON FILM 51 ½W	CARBON FILM 51 ½W	51	ONE USED	6
LJS-10-12-OV	2.2 mf 20 vdc	0.1 mf 100 vdc	4700 pf 500 vdc	330 mf 25 vdc	470 mf 25 vdc	33 mf 25 vdc	131	10	11K	4.3K	WW 51 1.1W	WW 51 1W	300	NONE USED	12
LJS-10-15-OV	2.2 mf 20 vdc	0.15 mf 100 vdc	4700 pf 500 vdc	330 mf 25 vdc	470 mf 25 vdc	33 mf 25 vdc	131	10	13K	10K	WW 51 1.1W	WW 51 1W	360	NONE USED	15
LJS-10-20-OV	2.2 mf 20 vdc	0.1 mf 100 vdc	4700 pf 500 vdc	220 mf 35 vdc	470 mf 35 vdc	22 mf 35 vdc	132	390	18K	15K	WW 51 1.1W	WW 51 1W	620	NONE USED	20
LJS-10-24-OV	2.2 mf 20 vdc	0.1 mf 100 vdc	4700 pf 500 vdc	220 mf 35 vdc	470 mf 35 vdc	22 mf 35 vdc	132	10	22K	51K	METAL OXIDE 2W, 51	WW 51 1W	910	NONE USED	24
LJS-10-28-OV	2.2 mf 20 vdc	0.068 mf 100 vdc	4700 pf 500 vdc	100 mf 50 vdc	330 mf 50 vdc	10 mf 50 vdc	132	10	24K	NOT USED	METAL OXIDE 2W, 51	WW 51 1W	1200	NONE USED	28

*Lambda part number

MP MASTER
MA28698